New Species and New Records of Psocoptera (Insecta) from South Australia

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Four new species of Psocoptera (barklice, booklice) are described from South Australia bringing the total known from South Australia to fifty-one. New species are *Caecilius lobatus* (Caeciliidae), *Ectopsocus exastis* (Ectopsocidae), *Ptycta trullifera* and *Tanystigma longitibia* (Psocidae). *Psocidus notialis* Smithers (Psocidae), a Western Australian species, is transferred to *Tanystigma* Smithers. Additional locality records are given for four previously recorded species.

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KEYWORDS: *Psocoptera*, *Caecilius lobatus*, *Ectopsocus exastis*, *Ptycta trullifera*, *Tanystigma longitibia*, South Australia.

INTRODUCTION

Smithers (1984) gave an account of the Psocoptera of South Australia which included forty-five species. Material collected since then is described here and knowledge of the South Australian fauna is brought up to date by making brief reference to work carried out since publication of the 1984 monograph. This can be summarized as follows. The type of *Stenopsocus striatifrons* (McLachlan) has been studied and the species redescribed and transferred to *Tanystigma* (Smithers 1987). The type locality of the species is, however, not known and its occurrence in South Australia remains unconfirmed. Badonnel and Lienhard (1988), when undertaking a generic revision of the Mesopsocidae, erected the genus *Mesopsocopsis* for *Mesopsocus reticulatus* Smithers, the only member of the family so far recorded from Australia. Rees (1994) and Rees and Wright (1995) have recorded Psocoptera associated with stored products in South Australia. Smithers (1997) has described a remarkable new genus and species of the Elipsocidae (*Yuntapsocus hollowayi* Smithers). The only known specimen, a female, is small, has a cylindrical body, is mostly colourless and has a circular, heavily sclerotized clunial plate which bears pores and specialized setae. This plate may be used to seal a tunnel or cavity or possibly provides an evaporative surface onto which secretions from the pores might be discharged. The specimen was beaten from vegetation but its pale colour and cylindrical form suggest that it is probably an inhabitant of the nests of ants or termites or burrows of wood-borers.

The present records bring the total number of species known from South Australia to fifty-one.

DESCRIPTIONS AND RECORDS

Caeciliidae

Caecilius lobatus sp. n.

FEMALE

Colouration (in alcohol)

Head pale brown with darker marks. Irregular confluent spots mesad of compound eye, across back of vertex and between antenna base and eye. A patch on each side of

median epicranial suture level with upper margin of eyes. Postclypeus with brown striae. Anteclypeus pale. Labrum mostly brown. Genae pale brown. Scape, pedicel and first two flagellar segments pale brown; remainder of flagellum darker. Eyes and ocellar tubercle black. Maxillary palps brown. Mesothoracic lobes and scutellum pale brown, parapsidal sutures pale. Dorsal lobe of metathorax pale brown, lateral lobes and scutellum darker. Pleura pale brown. Legs pale brown, distal tarsal segments a little darker than rest of legs. Fore wings (Fig. 1) hyaline, faintly tinged with pale brown pattern. Hind wings hyaline. Abdomen pale, terminal structures pale brown.

Morphology

Length of body: 2.0mm. Median epicranial suture very distinct but not reaching ocellar tubercle. Clypeal shelf absent. Length of flagellar segments: f1: 0.35mm; f2: 0.24mm. Antennae short, much shorter than fore wings. First flagellar segment straight, not enlarged. Labrum without styli at distolateral angle. Lacinia (Fig. 2) narrow in basal half, broad in distal half, end broad with transverse row of small, rounded denticles. Eyes moderately large but not reaching level of vertex. IO/D: 2.1; PO: 0.71. Lower part of mesothoracic precoxal suture present, running from mesotrochantin to about two thirds of way towards episternal suture. Legs with tibiae of uniform width throughout length. Measurements of hind leg: F: 0.49mm; T: 0.81mm; t1: 0.22mm; t2: 0.08mm; rt: 2.75:1; ct: 10,0. Ctenidiobothria small, especially those nearer distal end of first tarsal segment. Fore wing length: 2.5mm; width: 0.86mm. Fore wing (Fig. 1). Pterostigma with sharp posterior angle. Stem of Rs sinuous. Rs and M fused for a short length. Cell R3 narrow, R2+3 and R4+5 diverge at a small angle. Cell R5 narrow because of proximity to R4+5 to M. Areola postica steeply arched, top of areola postica a little nearer to M than to wing margin. Wing setae well developed. Pterostigma with sparse, evenly spaced setae. Cu2 setose. Epiproct (Fig. 3) lightly sclerotized with rounded hind margin. Setae long, especially those arising from margin. Paraproct (Fig. 4) lightly sclerotized without posterior marginal cone. Trichobothrial field round, individual trichobothria large, separated by sculptured integument. Subgenital plate (Fig. 5) with hind margin transverse in median part. Pigmentation slight. Lateral apophyses absent. Setae fairly evenly distibuted, long and fine. Two folds, one on each side, run parallel with posterolateral margin, ending at lateral ends of transverse part of hind margin. Gonapophyses (Fig. 6) with ventral valve curved but with small lobe on curved part of valve. Spermatheca (Fig. 7) with strongly sclerotized sac and long glandular area.

MALE

Unknown.

Material examined

South Australia. 1 female (holotype), 5km north of Yunta, 12.xi.1994, C.N.and A.S. Smithers. Holotype in South Australian Museum.

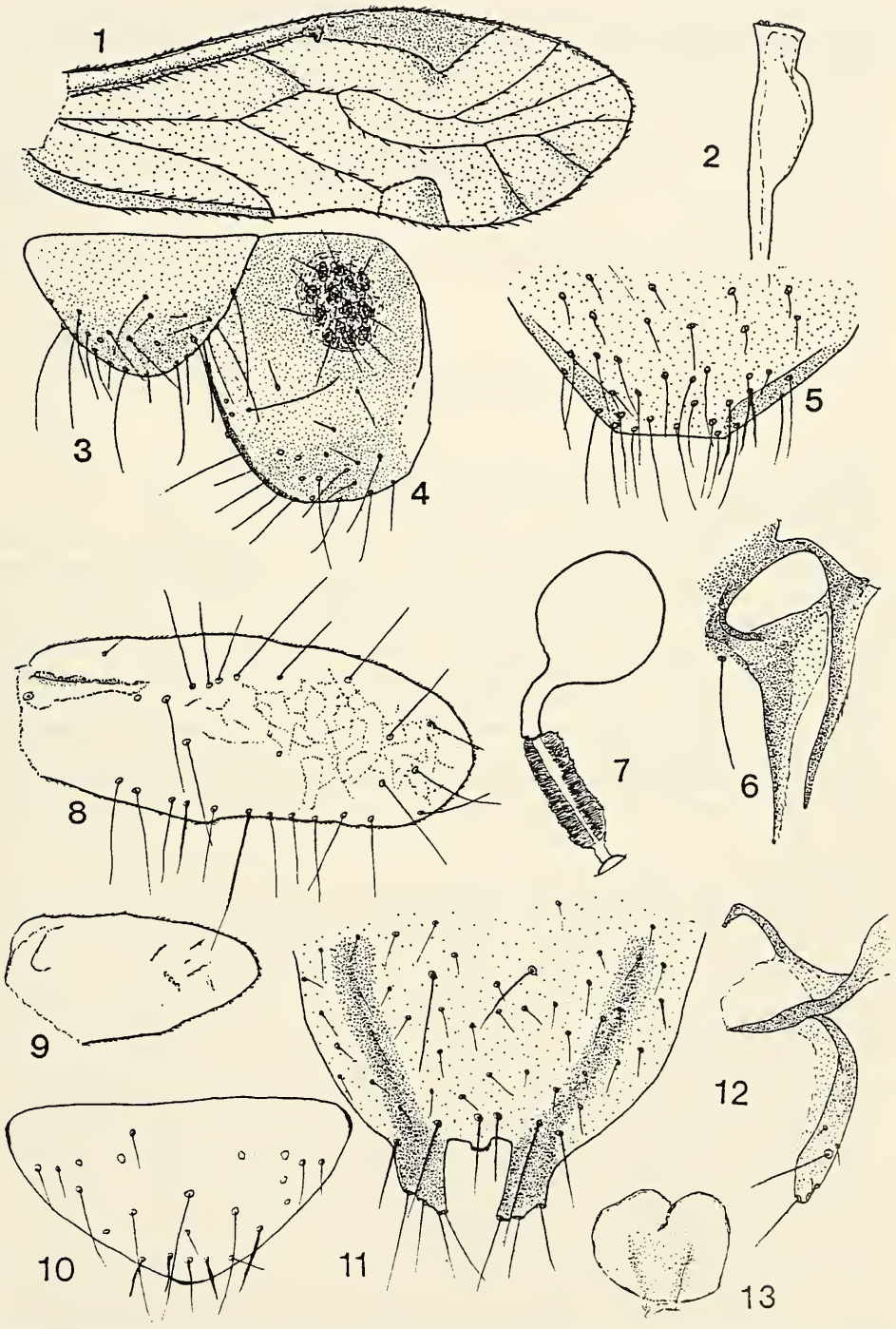
Discussion

Caecilius lobatus can easily be distinguished from other Australian species of this genus by its wing pattern which is very faint and the shape of the ventral valve of the gonapophyses in which there is a small sclerotized lobe on the curved section of the valve. There is a strong possibility that this species may later have to be placed in another genus, as is the case with most Australian species of *Caecilius*, when groups of species in this very large, worldwide, genus have been better defined.

Maoripsocus semifuscatus Tillyard

Material examined

South Australia. 3 males, 1 female, 5km north of Yunta, 7–8.v.1995, C.N. and



Figures 1–13. *Caecilius lobatus* sp.n. Female: 1) Fore wing, 2) Lacinia, 3) Epiproct, 4) Paraproct, 5) Subgenital plate, 6) Gonapophyses, 7) Spermatheca. *Ectopsocus exastis*. sp.n. Female: 8) Fore wing, 9) Hind wing, 10) Epiproct, 11) Subgenital plate, 12) Gonapophyses, 13) Sclerite of ninth sternite.

A.S. Smithers. 1 male, 15km north of Morgan, 8.v.1996, C.N. and A.S. Smithers. This species was described from New Zealand and has been recorded from New South Wales, Tasmania and South Australia.

Peripsocidae

Peripsocus maoricus (Tillyard)

Material examined

South Australia. 1 female, Cadell, 8.v.1995, A.S. Smithers. Described from New Zealand, previously recorded from New South Wales, Victoria, Tasmania, Western Australia and South Australia.

Ectopsocidae

Ectopsocus exastis sp.n.

FEMALE

Colouration (in alcohol)

Head very pale brown with darker marks. Vertex with groups of irregular spots adjacent to median epicranial suture and inner margin of compound eyes. Frons same colour as spots, i.e. darker than vertex. Postclypeus mostly same colour as spots on vertex but with an indistinct, narrow, pale line from epistomial suture to about half way to anterior margin of postclypeus. Labrum brown. Genae pale. Dark brown line from eye to antenna base. Scape and pedicel brown, flagellum paler. Eyes black. Ocelli pale, slightly darker centripetal marks. Maxillary palps pale, with brown distal segment. Thorax brown dorsally. Pleura dark brown in dorsal parts, brown along a line extending as a lateral line from antenna base to eye. Ventrally, pleura pale. Legs pale. Wing rudiments (Figs 8, 9) pale testaceous. Abdomen dorsally pale brown with suggestion of irregular darker segmental bands; laterally each segment with a dark brown spot. Abdomen ventrally pale.

Morphology

A small species. Micropterous. Length of body: 1.7mm. Median epicranial suture distinct only in upper part of vertex. Vertex somewhat horizontal, sloping into frons and postclypeus which are in same plane. Postclypeus only slightly bulbous. Head with fine setae, spaced closer than setal length. Antennae fairly short. Eyes small, placed laterally on head, well below level of vertex. IO/D: 3.4; PO: 0.6. Ocelli small, anterior ocellus about same size as lateral ocelli. Mesonotum and metanotum simple, without differentiation of antedorsum, lateral lobes and scutellum. Nota with well developed setae. Fore femur broad in relation to fore tibia. Hind legs without coxal organ. Measurements of hind leg: F: 0.33mm; T: 0.47mm; t1: 0.14mm; t2: 0.07mm; rt: 2:1. No ctenidiobothria on tarsi. Fore wing length: 0.3mm; width: 0.12mm. Fore wing (Fig. 8) reduced to a rudimentary flap without discernible venation. Surface with indistinct reticulate pattern of irregular shallow ridges in distal half. Long, finely pointed setae probably indicate positions usually occupied by veins. Margin with closely set setae. Hind wing length: 0.13mm; width 0.08mm. Hind wings (Fig. 9) without reticulate pattern and without setae but marginal microtrichia present. Epiproct (Fig. 10) very lightly sclerotized, sparsely setose with setae of various lengths arranged more or less symmetrically. Paraproct also lightly sclerotized, damaged in preparation of holotype. Subgenital plate (Fig. 11) setose, with two posterior lobes, usual sclerotized areas long and narrow, running forward from near base of posterior lobes. Lobes short and broad, inner margin straight. Posterior margin of plate, between lobes, sinuous, medially a little extended posteriorly in which area

margin bears fine spicules. Three or four terminal setae on each lobe and six strongly developed setae in row across plate anterior to hind margin in addition to smaller setae on body of plate. Two somewhat longer setae occur centrally on the plate. Structure of gonapophyses (Fig. 12) difficult to interpret. Ventral valve narrow, well sclerotized and apically sharply curved. Dorsal valve membranous, supported by sclerotized rod. External valve narrow, lightly sclerotized except for a supporting rod along margin in basal half, with one long seta on body of valve and a few smaller setae near distal end. Entrance to spermatheca (Fig. 13) with well sclerotized plate.

MALE

Unknown.

Material examined

South Australia. 1 female (micropterous) (holotype), 5km north of Yunta, 12.xi.1994, A.S.Smithers. Holotype in South Australian Museum.

Discussion

Wing polymorphism, microptery and brachyptery are relatively uncommon features in the large genus *Ectopsocus* McLachlan. Of the Australian species *E. axillaris* (Smithers) has brachypterous males. *E. edwardsi* New has micropterous, brachypterous and macropterous forms in both sexes. *E. richardsi* (Pearman) has brachypterous males and females. In *E. vachoni* Badonnel males are micropterous and females are micropterous or macropterous. *E. exastis* is known only from one female which is micropterous. It is easily distinguished from *E. axillaris*, *E. edwardsi* and *E. richardsi* in that at least some veins of the fore wings are obvious in those species whereas none are discernible in *E. exastis*. *E. vachoni* is very similar to *E. exastis* in lacking veins in micropterous specimens and in having minute spicules along the hind margin of the subgenital plate between the posterior lobes. The margin between the lobes is sinuous in *E. exastis* whereas it is transverse in *E. vachoni*. Ocelli are present in micropterous *E. exastis* but not in micropterous specimens of *E. vachoni*. In *E. vachoni* the sclerotized areas of the subgenital plate are somewhat shorter and broader than in *E. exastis*, forming a less extended "V". The posterior lobes of the subgenital plate in *E. exastis* are longer and have fewer apical setae than in *E. vachoni* and the inner margins of the lobes quite straight. In *E. exastis* there is a well developed sclerotized structure associated with the entrance to the spermatheca, a feature reported for very few species of *Ectopsocus*.

Psocidae

Ptycta umbrata New

Material examined

South Australia. 2 females, 14km northeast of Peterborough, 7.v.1995, A.S. Smithers. Previously known from New South Wales, Victoria and other South Australia localities.

Ptycta trullifera sp. n.

MALE

Colouration (in alcohol)

Head ivory with dark brown pattern. A few large, irregular, well defined spots across back of vertex, adjacent to median epicranial suture and inner margins of compound eyes. A line from ocellar tubercle to anterior margin of eyes where they meet epis-

tomial suture. Frons with dark anterior margin, an ivory spot on each side and a smaller median spot, otherwise dark. Postclypeal striae well defined, mostly parallel with one another, each with an isolated anterior spot near anterior margin of postclypeus. A few striae on each side curved. Labrum with dark median anterior oval mark, basad of which is a median dark spot. Anteclypeus pale. Genae ivory. First flagellar segment with brown basal half, very dark brown distally; more distal segments dark. Eyes black. Ocellar tubercle dark. Maxillary palps pale, fourth segment very dark. Meso- and metathorax mostly chocolate brown with irregular, ivory median stripe and ivory areas near wing bases. Thorax laterally dark with pale areas on mesopleura. Coxae dark. Femora pale with mottled pattern. Tibiae pale brown. Tarsi brown. Fore wings (Fig. 14) hyaline with brown marks. Abdomen pale with dark brown terminal structures.

Morphology

Length of body: 2.4mm. Head with very sparse, very short, fine setae. Antennae with fine setae, a few of which are longer than flagellar diameter. Length of flagellar segments: f1: 0.43mm; f2: 0.27mm. Eyes large, reaching level of vertex. IO/D: 1.1; PO: 0.91. Ocellar tubercle very prominent. Measurements of hind leg: F: 0.49mm; T. 1.11mm; t1: 0.29mm; t2: 0.12mm; rt: 2.4:1; ct: 19,2. Fore wing (Fig. 14) with Sc ending in R1. Rs and M meet in point. First and second sections of Cu1 almost in a straight line with one another. Fore wing glabrous. Hind wing with Rs and M fused for a length. A few very fine, very short setae on margin between R2+3 and R4+5. Epiproct (Fig. 16) lightly sclerotized with a sclerotized marginal band. Posteriorly band is thicker and the posterior margin is extended back into a small membranous lobe. Marginal band sinuous, becoming narrower anteriorly. Epiproct extended over tenth tergite as a shallowly bilobed flap. Paraproct (Fig. 15) heavily sclerotized with very well developed, curved, posterior process and narrower, ventrally directed apophysis. Trichobothrial field large. At base of paraproct is a heavily sclerotized lobe. Tenth tergite well sclerotized, narrow medially. Ninth tergite with anterior margin developed into heavily sclerotized ridge, especially laterally. Hypandrium (Fig. 18) symmetrical, deeply cleft behind to form two upturned lobes bearing apophyses. Phallosome (Fig. 17) closed anteriorly, inner parameres fused distally and expanded into flattened, broad, divided, strongly upturned lobe. External parameres membranous, each supported by a narrow sclerotized rod, each expanded distally into a delicate membranous lobe.

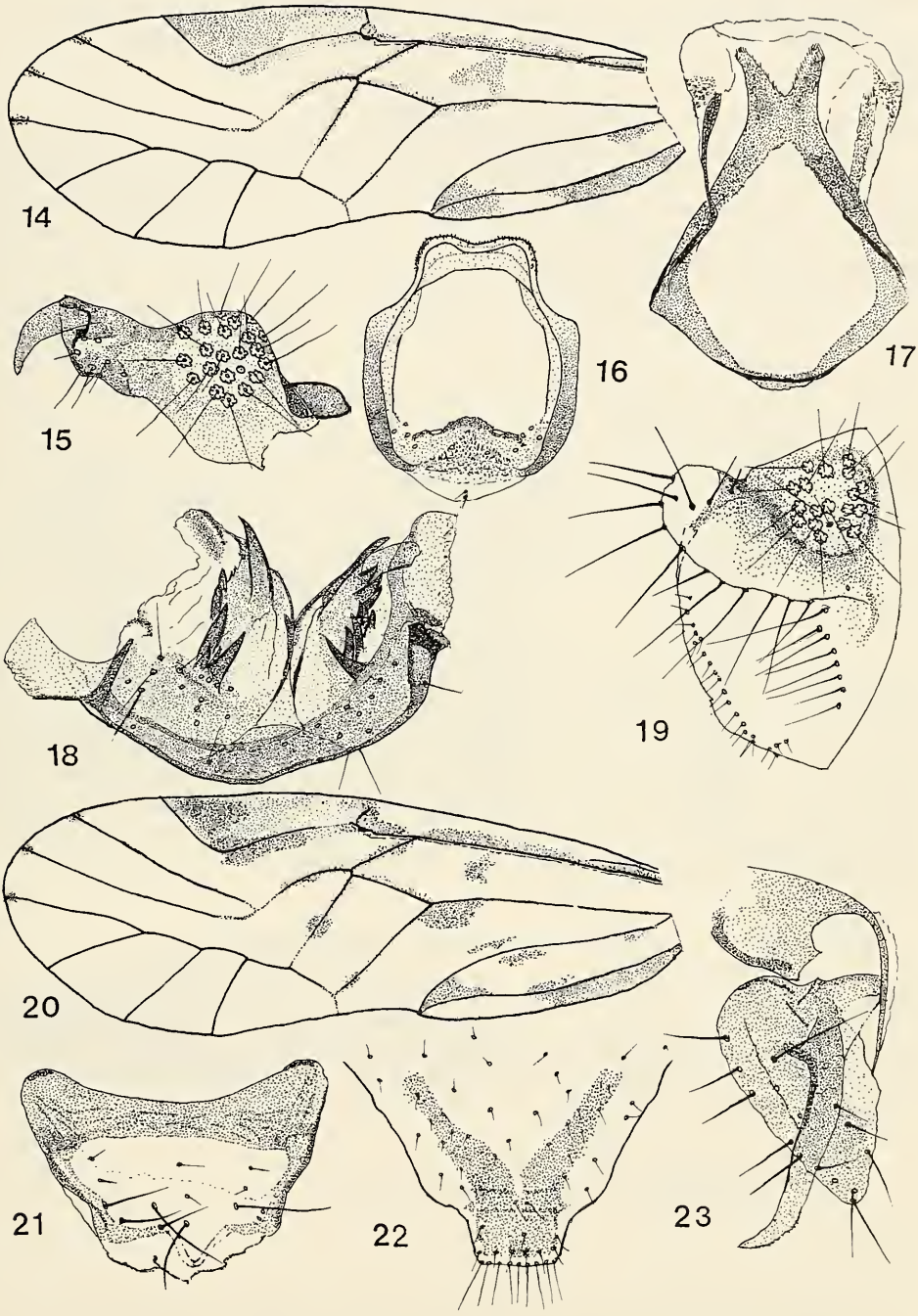
FEMALE

Coloration (in alcohol)

As in male but brown wing areas more extensive (Fig. 20).

Morphology

Length of body: 2.2mm. Length of flagellar segments: f1: 0.35mm; f2: 0.23mm. Eyes smaller than in male, not reaching level of vertex. IO/D: 2.06; PO: 0.75. Ocellar tubercle prominent but less so than in male. Measurements of hind leg: F: 0.40mm; T: 1.0mm; t1: 0.24mm; t2: 0.11mm; rt: 2.18:1; ct: 17,0. Fore wing length: 2.9mm; width: 1.0mm. Fore wing (Fig. 20) venation as in male. Hind wing length: 2.3mm; width: 0.73mm. Epiproct (Fig. 21). Paraproct (Fig. 19). Subgenital plate (Fig. 22) with short, square-ended, posterior, median lobe which has a row of ten strong marginal setae and a shorter submarginal row of only five small setae. Plate otherwise sparsely setose. Sclerotized areas of plate in form of a substantial "V". Gonapophyses (Fig. 23) with short ventral valve, dorsal valve long, narrow, tapering only near distal end. External valve somewhat transverse, of a single lobe only, of approximately same width for most of length but narrowed posteriorly, setose.



Figures 14–23. *Ptycta trullifera* sp.n. 14) Male fore wing, 15) Male paraproct, 16) Male epiproct, 17) Phallosome, 18) Hypandrium, 19) Female paraproct, 20) Female fore wing, 21) Female epiproct, 22) Subgenital plate, 23) Gonapophyses.

Material examined

South Australia. 1 male (holotype), female (allotype), 2 females (paratypes) 5 km north of Yunta, 7.v.1995, A.S.Smithers. Holotype and paratypes in South Australian Museum.

Discussion

Since the erection of *Ptycta* (Enderlein 1925) to accommodate *Psocus haleakalae* Enderlein and *Psocus distinguendus* Perkins from Hawaii and *Clematostigma schillei* Enderlein from Java many species have been added to the genus. The generic limits became somewhat obscure until Thornton (1984) studied the Hawaiian fauna, including the type species *P. haleakalae*, and redefined the genus. There is little doubt that species have been placed in *Ptycta* which are not congeneric with the type species and that these will eventually have to be reassigned to other genera. These include some Australian species, of which there are altogether at present twelve in the genus. Some of these are known only from one sex. The male phallosome in *Ptycta* is relatively simple, consisting of a ring-like structure which may be rounded or angular with short, mostly anterolaterally directed spur-like extensions. In *P. emarginata* New and *P. improcera* New the phallosome is unusual in that where the internal parameres are fused posteriorly they form an upturned plate which has a broadly divided hind margin which is finely toothed. In *P. trullifera* the phallosome has a similar hind margin but also has weakly developed external parameres, each consisting of a membranous lobe strengthened by a sclerotized rod. It can easily be recognized by this feature. In *P. campbelli* Schmidt and Thornton there is a suggestion of the rudiments of external parameres but this species lacks the upturned plate.

The Australian species of *Ptycta* can be differentiated by differences in details of the genitalia of both sexes. More obvious superficial differences are to be seen in the fore wing pattern and the relationship of veins Rs and M to one another. In particular, *P. trullifera* does not have a spot in cell R5 of the fore wing just behind the fork of Rs, and Rs and M are joined by a short crossvein. Several of the other species have such a spot, namely, the females of *P. prosta* Schmidt and Thornton, *P. emarginata* New, *P. glossoptera* New and *P. australis* Schmidt and Thornton. In all of the Australian species other than *P. trullifera* Rs and M in the fore wing are either fused for a length or meet in a point. These features, taken together with those of the genitalia should permit species identification.

Tanystigma tardipes (Enderlein)

Material examined

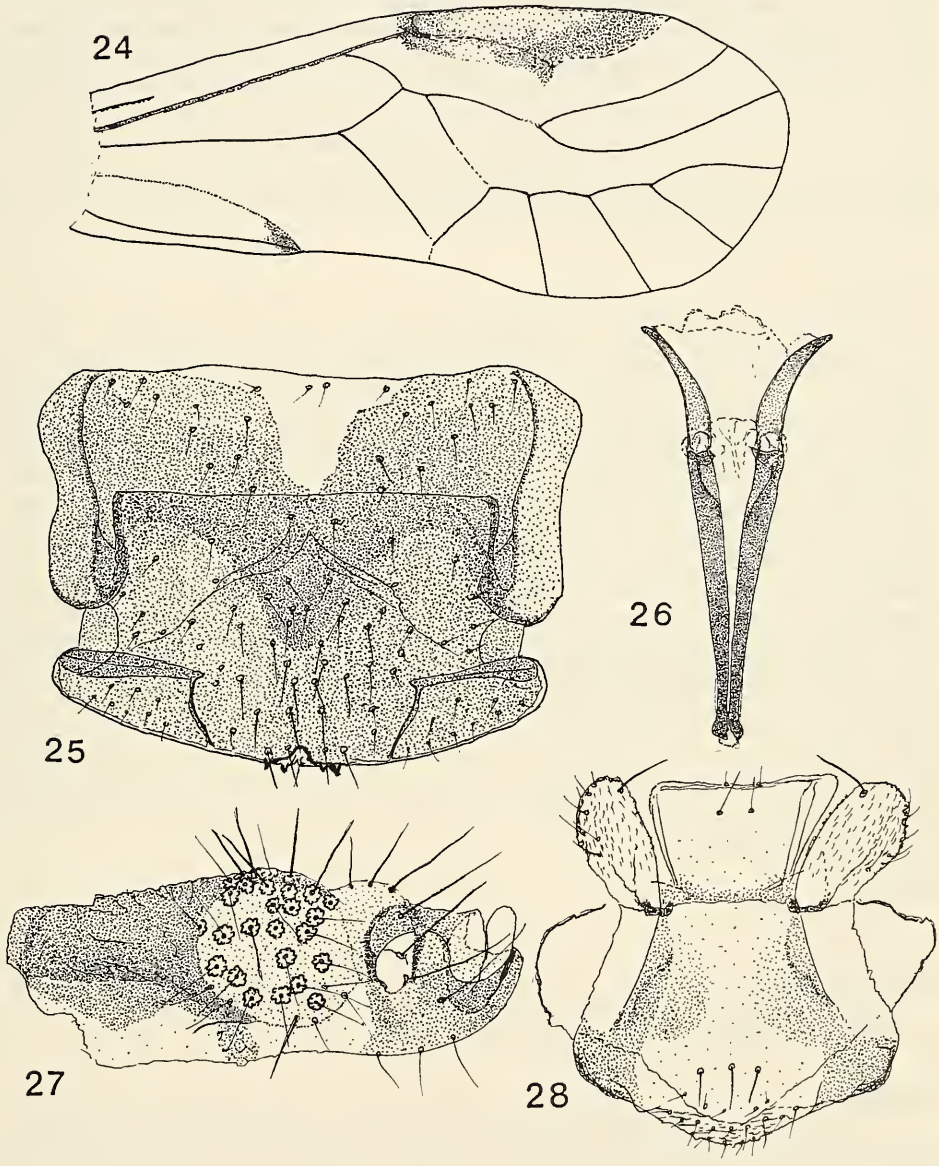
South Australia. 2 males, 2 females, 15km northeast of Morgan, 8.v.1995, A.S.Smithers. 2 males, 5 females, 14km northeast of Peterborough, 7.v.1995, A.S.Smithers. Previously known from Victoria, Tasmania and a few other South Australian localities.

Tanystigma longitibia sp.n.

MALE

Colouration (in alcohol)

Head pale grey with dark chocolate brown marks. Irregular spots adjacent to compound eyes, across back of vertex and adjacent to posterior part of dark median epicranial suture. Ocelli surrounded by dark circles. A line from lateral ocelli to antenna bases. Postclypeal striae each broken into a series of slightly elongated spots, the two middle



Figures 24–28. *Tanystigma longitibia* sp.n. Male: 24) Fore wing, 25) Hypandrium, 26) Phallosome, 27) Paraproct, 28) Epiproct.

striae complete and fused into one broader median stripe. Labrum with semicircular mark in middle of anterior part, the semicircle joined to the clypeal suture by a small spot. Frons with median stirrup-shaped mark. Dark mark between compound eye and antenna base. Genae grey. Scape, pedicel and first flagellar segment of antenna dark brown, more distal segments very dark. Distal segment of maxillary palp very dark brown. Dorsum of thorax dark with broken, irregular, pale brown, median, longitudinal stripe. Lateral lobes of mesothorax dark, sutures pale brown. A pale line along lateral part of lobe curving towards midline just anterior to scutellum. Metanotum dark with pale spot near wing base in addition to pale midline. Pleura pale with dark sutures. Fore wing (Fig. 24) hyaline except for pterostigma, postpterostigmal mark and a small brown mark in angle at nodulus. Coxae dark. Femora pale with irregular dark mottled pattern. Tibiae brown, dark near femora, tarsi a little darker. Abdomen pale, except for very dark chocolate brown terminal structures.

Morphology

Length of body: 2.4mm. Median epicranial suture not reaching ocellar tubercle. Anterior arms absent but dark line almost in position usually occupied by suture. Length of flagellar segments: f1: 0.59mm; f2: 0.59mm. Eyes moderately large but prominent, not reaching level of vertex. Inner margins diverge strongly behind. IO/D: 2.4; PO: 0.85. Ocelli large, anterior ocellus a little smaller than lateral ocelli. Antennae fine, setae fine, only a little longer than flagellar diameter. Measurements of hind leg: F: 0.54mm; T: 1.19mm; t1: 0.32mm; t2: 0.15mm; rt: 2.13:1; ct: 18,3. Ctenidiobothria well developed forming a strong comb on distal tarsal segment. Hind tibia well supplied with ctenidiobothria. Fore wing length: 3.0mm; width: 1.3mm. Fore wing (Fig. 24) glabrous. Sc ends free in costal cell. Pterostigma with short, indistinct spurvein. Rs evanescent just basad of fork. M evanescent just basad of apex of areola postica. Areola postica tall, with narrow apex, second section of Cu1a at strong angle to first. Hind wing glabrous. Epiproct (Fig. 28) with rectangular, median anterior lobe and apically rounded lobe with a rough surface on each side of median lobe. Paraproct (Fig. 27) with short, very strongly curved distal process. Trichobothrial field large, trichobothria not occupying whole area. Hypandrium (Fig. 25) broad, with lateral lobes, small median posterior emargination with two small cones on each side of the notch. Phallosome (Fig. 26) open posteriorly with parameres fused anteriorly, each ending behind in a pointed, outwardly curved distal sclerite. Membranous penial bulb slightly rugose, without sclerites.

FEMALE

Unknown.

Material examined

South Australia. 1 female (holotype), 15km northeast of Morgan, 8.v.1995, C.N.Smithers. Holotype in South Australian Museum.

Discussion

The male of *T. longitibia* differs from all other known males of *Tanystigma* species, other than that of *T. notialis* (Smithers), in having a dark spot in the angle at the nodulus. The phallosome also differs in proportions and form, especially of the distal sclerites of the external parameres which are well developed and curve outwards. The shape of the hypandrium is also distinctive. The longer form of the phallosome with its outwardly directed, simple, terminal sclerites distinguishes this species from *T. notialis,* in which the phallosome is relatively shorter and in which the distal sclerites of the external parameres are shorter and bifid. *T. notialis* is much bigger than *T. longitibia,* having a wing length of 3.9mm as opposed to 3.0mm in *T. longitibia.*

Tanystigma notialis (Smithers) **comb. nov.**
Psocidus notialis Smithers, 1972. *Australian Zoologist* 17(1):20, figs 18–25.

Psocidus notialis Smithers was described from Western Australia (Smithers 1972) and is here transferred to *Tanystigma* (*Tanystigma notialis* (Smithers) **comb. nov.**) on the basis of the form of the phallosome, hypandrium and epiproct of the male, the shape of the subgenital plate and gonapophyses of the female and the elongate form of the pterostigma in both sexes.

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REFERENCES

Badonnel, A. and Lienhard, C. (1988). Révision de la famille des Mesopsocidae (Insecta, Psocoptera). *Bulletin du Muséum national d'Histoire naturelle, Paris* (4)**10**(A)(2):375–412.

Enderlein, G. (1925). Beiträge zur Kenntnis der Copeognathen. IX. *Konowia* **4**:97–108.

Rees, D.P. (1994). Studies of distribution and control of Psocoptera (psocids or booklice) associated with the grain industry in Australia. *CSIRO Australia. Division of Entomology Report* **57**:1–23.

Rees, D.P. and Wright, E.J. (1995). *Lachesilla quercus* (Kolbe) (Psocoptera: Lachesillidae): First Record in Australia and a New Pest of Grain Stores. *Journal of the Australian Entomological Society.* **34**:355–357.

Smithers, C.N. (1972). A collection of Psocoptera (Insecta) from Western Australia including four new species. *Australian Zoologist* **17**(1):15–23.

Smithers, C.N. (1984). The Psocoptera of South Australia. *Records of the South Australian Museum* **18**(20):453–491.

Smithers, C.N. (1997). An apterous, possibly phragmotic new species representing a new genus and subfamily of Elipsocidae (Psocoptera) from South Australia. *Entomologica Scandinavica* **28**(1):97–101.

Thornton, I.W.B. (1984). Psocoptera of the Hawaiian Islands. Part III. The endemic complex of *Ptycta* species: systematics, distribution and possible phylogeny. *International Journal of Entomology* **26**(1–2):1–128.